I-95 Corridor Coalition

Corridor-Wide Center-to-Center Communications Study

TECHNICAL MEMORANDUM

Executive Summary

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Executive Summary

The I-95 Corridor Coalition Corridor-Wide Center-to-Center (C2C) Communications Study project is structured to provide a technical report outlining a series of recommendations to employ a stable and reliable communications mechanism during, and subsequent to, catastrophic events between multiple transportation management centers along the I-95 Corridor. This study targets I-95 Corridor Coalition participating agencies looking to maintain an exchange of emergency management information to manage their operations when traditional communication means (e.g. landline, wireless and cellular phone) are not available. Generally, the communication system is, in most respects, the least failure prone element of an overall system, but potentially has a high risk of being disrupted in case of emergency situations or catastrophic events, such as terrorist attack, extreme weather, earthquake or hurricane. The communications between Transportation Management Centers (TMCs) or Traffic Control Centers (TCCs) of member agencies; emergency communications between TMCs/TCCs and public safety agencies or emergency management agencies, could be severely disrupted. Currently none of the existing information exchange systems in the I-95 Corridor Coalition systematically provides any emergency communication backup mechanism. The outcome of this study is a series of technical recommendations regarding a C2C communications mechanism to support the I-95 Corridor Coalition information exchange system, which will help participating agencies understand the C2C communication standards and backup mechanism for a stable and reliable information exchange system. This project includes total four task orders.

The Task Order One within the C2C Communications Study included outlining the current state of the C2C Intelligent Transportation System (ITS) standards as it relates to the National Transportation Communications for ITS Protocol (NTCIP) and the National ITS Architecture. The first task also included the identification of applicable communication network technologies for meeting C2C communication needs, which included: Synchronous Optical Network (SONET), Asynchronous Transfer Mode (ATM), and Ethernet (Standard, Fast Ethernet, or Gigabit Ethernet). It additionally provided a brief summary of the characteristics, advantages and disadvantages of each network technology.

The Task Order Two presented research of existing information sharing/exchange systems that currently exist along the I-95 corridor, including systems being utilized by Coalition members and others. Only systems that have the capability of C2C communications at a corridor-level were considered and the identified systems were representative of the best practices in ITS standards utilization.

The Task Order Three included an effort in reviewing the C2C guidelines (outlined in Task Order One) and the existing eleven information exchange systems with C2C deployments (identified as best practices in Task Order Two), undertook an analysis to identify the divergences from the National ITS Architecture C2C standards and also

highlighted the gaps between the existing best practices in terms of the communication mechanism, interagency video sharing technology and the system functional requirements. The purpose of this task was to identify problem areas in the existing systems and drove the technology recommendations to be defined in the Task Order Four of this project.

The Task Order Four represented an expansive effort in identifying, evaluating, and describing viable C2C communications standards and technologies based upon the research performed in Task Orders Two and Three. As a result of this task, a series of technical recommendations regarding a C2C communications mechanism to support the I-95 Corridor Coalition information exchange system were developed. The technical recommendations were focused on three major areas: C2C communication standards, system architecture and communication architecture, and the interagency video sharing technology. The advantages and disadvantages of each technology were also highlighted.

As a result of this project, the Internet networking protocols and standards are recommended for the I-95 Corridor Coalition information exchange system and its components: XML (eXtensible Markup Language) data structures based on ITS messaging standards, retrieved over the Internet using HTTP/HTTPS (Hypertext Transfer Protocol), are recommended to be the preferred means of publishing traffic and incident data information; The interfaces would be implemented as SOAP-based (Simple Object Access Protocol) Web services; Administrative user interfaces would be adequately implemented in HTML (HyperText Markup Language).

System architecture and communication architecture are recommended for the information exchange system in this project. Its logical architecture, functional architecture and physical architecture are also introduced: IP/Ethernet-based communication network architecture is recommended; Very Small Aperture Satellite Earth Terminals (VSAT) is recommended as the C2C communication backup in case of emergency situations. Several satellite Internet service providers and their various service plans (on-demand or regular plan) are available to meet the requirements of the I-95 Corridor Coalition information exchange system. The one-time installation and equipment cost is normally less than $20,000 per site, and the average monthly service cost is about $500 plus the usage-based charges if on-demand service is activated during emergency situations.

A hybrid architecture is recommended to share the video from both the existing legacy cameras and the IP-addressable cameras. All video encoding/decoding equipment in future deployments should be capable of transmitting both MPEG-2 and MPEG-4 (Moving Picture Experts Group) video streams. 100 Mbps Fast IP/Ethernet for the sharing of small number of video feeds (no more than ten video feeds) and 1,000 Mbps Gigabit IP/Ethernet for large number of shared video feeds (no more than one hundred video feeds) are recommended for future deployments.